

WHAT IS CLAIMED IS:

1. An electrical system comprising:
  - a power source providing a first voltage;
  - a device that operates at a second voltage that is lower than the first voltage;
  - an actuator for actuating the device;
  - a control circuit coupled to the power source, the actuator, and the device, for:
    - receiving the first voltage from the power source;
    - controlling the operation of the actuator using the first voltage;
    - producing the second voltage, and
    - providing the second voltage to the device in response to the operation of the actuator.
2. The system of claim 1, wherein the device is a dc motor for cranking an engine and the actuator is a solenoid and wherein the providing of the second voltage is stopped after the engine is cranked.
3. The system of claim 1, wherein the power source provides 110V and the device is rated at 64V.
4. The system of claim 1, wherein the control circuit produces and provides a pulse width modulated second voltage.
5. The system of claim 1, wherein the second voltage is approximately 50V.
6. The system of claim 1, wherein the control circuit includes a dc chopper module for producing the second voltage.

7. The system of claim 1, wherein the operation of the actuator is controlled by solid state relays.

8. An electrical adapter apparatus for allowing a device that operates at a first voltage to function without modification in an electrical system providing a second voltage, wherein the first voltage is lower than the second voltage, the device having an actuator, the apparatus comprising a switch and a control circuit, the control circuit:

receives the second voltage from the electrical system;

causes the actuator to actuate the device using the second voltage in response to the switch closing;

produces the first voltage;

provides the first voltage to the device at or after the actuation of the device;

and

inhibits the first voltage from being provided in response to the switch opening.

9. The apparatus of claim 8, wherein the device is a dc motor and the actuator is a solenoid.

10. The apparatus of claim 8, wherein the control circuit produces a pulse width modulated first voltage.

11. The apparatus of claim 8, wherein the switch is opened and closed by an operator of the apparatus.

12. The apparatus of claim 8, wherein the second voltage is 110V and the device is rated at 64V.

13. The apparatus of claim 8, wherein the first voltage is approximately 50V.

14. A method for allowing a device to be operated at a first voltage to function with a power source providing a second voltage, the first and second voltage being different, the device having an actuator, and the method comprising:

receiving the second voltage from the power source;

controlling the actuator using the second voltage ;

producing the first voltage;

providing the first voltage to the device in response to a first action of the actuator; and

inhibiting the first voltage from being provided to the device in response to a second action of the actuator.

15. The method of claim 14, wherein the actuator is a solenoid and the second voltage is provided to a starter motor.

16. The method of claim 14, wherein producing the first voltage includes producing a pulse width modulated voltage.

17. The method of claim 14, wherein inhibiting the first voltage is performed in response to a switch opening.

18. The method of claim 14, wherein the device is rated at 64V and the receiving step includes receiving 110V from the power source.

19. The method of claim 14, wherein the first voltage is approximately 50V.
20. An electrical adapter apparatus for use with a power source providing a first voltage, the adapter apparatus outputting a second voltage lower than the first voltage, the adapter apparatus comprising:
- a first relay activated by a switch closing;
  - a second relay activated in response to the first relay's activation;
  - a dc chopper module coupled to the power source, wherein the activation of the first and second relays causes the dc chopper module to output the second voltage;
  - a third relay, coupled to the second relay and the dc chopper module, activated when the dc chopper module is caused to output the second voltage, wherein the activation of the third relay deactivates the second relay, and wherein the first relay is deactivated by the switch opening, the deactivation of the first and second relays causing the dc chopper module to deactivate, thereby stopping the second voltage from being output.

21. The electrical adapter apparatus of claim 20, wherein the apparatus is coupled to a solenoid and dc motor, and wherein

a first terminal of the solenoid is coupled to the first relay, the terminal receiving the first voltage when the first relay is activated;

a pull-in coil of the solenoid is coupled to the second relay, wherein the activation of the second relay provides a ground path to said coil;

a hold-in coil of the solenoid is coupled to a ground;

a second terminal of the solenoid is coupled to the dc chopper module; and

the dc motor is coupled to the dc chopper module and receives the second voltage,

wherein the activation of the first and second relays causes an electrical connection between the first and second terminals, thereby applying the first voltage to the dc chopper module and causing the second voltage to be output, and wherein the deactivation of the first and second relays causes the connection to break, thereby deactivating the dc chopper and inhibiting the second voltage.

22. The electrical adapter apparatus of claim 20, wherein the power source provides 110V.

23. The electrical adapter apparatus of claim 21, wherein the dc motor is rated at 64V and operates at approximately 50V.

24. The electrical adapter apparatus of claim 20, wherein the dc chopper module provides a pulse width modulated voltage.

25. The electrical adapter apparatus of claim 20 further comprising first, second and third resistors coupled between a ground and the first, second, and third relays, respectively.

26. The electrical adapter apparatus of claim 20 further comprising a slow blow fuse coupled between the second relay and a ground.

27. The electrical adapter apparatus of claim 20, wherein the dc chopper module is coupled through a fuse to the power source.

28. The electrical adapter apparatus of claim 20 further comprising a switch for arming the first relay and the dc chopper module, wherein the dc chopper module is coupled to the switch through a fuse.

29. The electrical adapter apparatus of claim 20 further comprising first and second free-wheeling diodes coupled to the first and second relays, respectively, for preventing voltage spikes.

30. The electrical adapter apparatus of claim 20, wherein the relays are solid-state relays.

31. The electrical adapter apparatus of claim 20, wherein the second voltage is approximately 50V.

32. A control circuit for use with a power source providing a first voltage, the control circuit providing a second voltage different from the first voltage, the control circuit comprising:

a first relay activated by a switch closing;

a second relay activated by the first relay;

a dc chopper module coupled to the power source, said module providing the second voltage when activated;

a third relay coupled to the second relay; and

a control line coupled to the third relay and the dc chopper module for activating the third relay and the dc chopper module,

wherein the activation of the first and second relays causes the first voltage to be applied to the control line, thereby activating the dc chopper module and the third relay, and wherein the third relay deactivates the second relay and opening the switch deactivates the first relay, thereby removing the first voltage from the control line.

33. The control circuit of claim 32, wherein the power source provides 110V.

35. The control circuit of claim 32, wherein the dc chopper module provides a pulse width modulated voltage.

36. The control circuit of claim 32 further comprising first, second and third resistors coupled between a ground and the first, second, and third relays, respectively.

37. The control circuit of claim 32 further comprising a slow blow fuse coupled between the second relay and a ground.

38. The control circuit of claim 32, wherein the dc chopper module is coupled through a fuse to the power source.

39. The control circuit of claim 32 further comprising a switch for arming the first relay and the dc chopper module, wherein the dc chopper module is coupled to the switch through a fuse.

40. The control circuit of claim 32 further comprising first and second free-wheeling diodes coupled to the first and second relays, respectively, for preventing voltage spikes.

41. The control circuit of claim 32, wherein the relays are solid-state relays.

42. The control circuit of claim 32, wherein the second voltage is approximately 50V.